CLAIMS

1. In an electrically and thermally conductive adhesive composition for cementing together at least one metallized surface of a positive temperature coefficient (PTC) element to at least one metallic electrode, in the manufacture of PTC thermistor devices, and in which the adhesive component is essentially a curable silicone prepolymer, the improvement which comprises including in the composition finely divided silicon carbide and finely-divided silicon.

2. An electrically and thermally conductive adhesive composition according to claim 1, wherein said curable silicone prepolymer is a curable silicone rubber prepolymer, and said composition is additionally characterized by at least one of the following features, namely:

(a) said metallized surface is selected from the group of aluminized and silvered surfaces;

(b) said at least one metallic electrode is at least one aluminum electrode;

(c) said composition further includes a finely-divided metallic powder;

(d) said finely divided silicon carbide and finely-divided silicon are constituted by a mixture which is a by-product of a step in the manufacture of silicon semiconductors, which comprises polishing with silicon carbide, silicon plates or silicon wafers.

3. An electrically and thermally conductive adhesive composition according to claim 1, wherein said curable silicone prepolymer is a curable silicone rubber prepolymer, and said composition is additionally characterized by at least one of the following features, namely:

(a) said metallized surface is selected from the group of aluminized and silvered surfaces;

(b) said at least one metallic electrode is at least one aluminum electrode;

(c) said composition further includes a finely-divided metallic powder selected from the group consisting of aluminum and silver powder;

(d) said finely divided silicon carbide and finely-divided silicon are constituted by a mixture which is a by-product of a step in the manufacture of silicon

semiconductors, which comprises polishing with silicon carbide, silicon plates or silicon wafers.

4. An electrically and thermally conductive adhesive composition according to either claim 2 or claim 3, wherein said curable silicone prepolymer is a curable silicone rubber prepolymer, and said composition is additionally characterized by at least one of the following features, namely:

(i) said finely-divided metallic powder has a particle size no greater than about 40 μm;

(ii) said finely divided silicon carbide and finely divided silicon have particle sizes no greater than about 14 μm;

(iii) said finely divided silicon carbide and finely-divided silicon are present in a respective weight ratio of about 0.9 to 1.1 : about 1.0;

(iv) the respective weight ratios of said finely-divided metallic powder, said finely divided silicon carbide taken together with finely divided silicon, and said curable silicone prepolymer, are 0.1 (±5%) : 1.1 (±5%) : 1 (±5%).

5. An electrically and thermally conductive composition according to claim 1, wherein said curable silicone prepolymer has a viscosity at ambient temperature within the range of 15,000 to 25,000 μPa/sec.

6. An electrically and thermally conductive composition according to claim 4, wherein said curable silicone prepolymer has a viscosity at ambient temperature within the range of 15,000 to 25,000 μPa/sec.

7. In a method for manufacturing a positive temperature coefficient (PTC) thermistor device which includes at least one step of cementing together at least one metallized surface of a PTC element to at least one metallic electrode, by means of an electrically and thermally conductive adhesive composition in which the adhesive component is essentially a curable silicone prepolymer, the improvement which comprises including in the composition finely divided silicon carbide and finely-divided silicon.

8. A method according to claim 7, wherein said curable silicone prepolymer is a curable silicone rubber prepolymer, and said composition is additionally characterized by at least one of the following features, namely:

(a) said metallized surface is selected from the group of aluminized and silvered surfaces;

(b) said at least one metallic electrode is at least one aluminum electrode;

(c) said composition further includes a finely-divided metallic powder;

(d) said finely divided silicon carbide and finely-divided silicon are constituted by a mixture which is a by-product of a step in the manufacture of silicon semiconductors, which comprises polishing with silicon carbide, silicon plates or silicon wafers.

9. A method according to claim 7, wherein said curable silicone prepolymer is a curable silicone rubber prepolymer, and said composition is additionally characterized by at least one of the following features, namely:

(a) said metallized surface is selected from the group of aluminized and silvered surfaces;

(b) said at least one metallic electrode is at least one aluminum electrode;

(c) said composition further includes a finely-divided metallic powder selected from the group consisting of aluminum and silver powder;

(d) said finely divided silicon carbide and finely-divided silicon are constituted by a mixture which is a by-product of a step in the manufacture of silicon semiconductors, which comprises polishing with silicon carbide, silicon plates or silicon wafers.

10. A method according to either claim 8 or claim 9, wherein said curable silicone prepolymer is a curable silicone rubber prepolymer, and said composition is additionally characterized by at least one of the following features, namely:

(i) said finely-divided metallic powder has a particle size no greater than about 40 μm;

(ii) said finely divided silicon carbide and finely divided silicon have particle sizes no greater than about 14 μm;

(iii) said finely divided silicon carbide and finely-divided silicon are present in a respective weight ratio of about 0.9 to 1.1 : about 1.0;

(iv) the respective weight ratios of said finely-divided metallic powder, said finely divided silicon carbide taken together with finely divided silicon, and said curable silicone prepolymer, are 0.1 (±5%) : 1.1 (±5%) : 1 (±5%).

11. A method according to claim 7, wherein said curable silicone prepolymer has a viscosity at ambient temperature within the range of 15,000 to 25,000 μPa/sec.

12. A method according to either claim 8 or claim 9, wherein said curable silicone prepolymer is a curable silicone rubber prepolymer having a viscosity at ambient temperature within the range of 15,000 to 25,000 μPa/sec, and said composition is additionally characterized by at least one of the following features, namely:

(i) said finely-divided metallic powder has a particle size no greater than about 40 μm;

(ii) said finely divided silicon carbide and finely divided silicon have particle sizes no greater than about 14 μm;

(iii) said finely divided silicon carbide and finely-divided silicon are present in a respective weight ratio of about 0.9 to 1.1 : about 1.0;

(iv) the respective weight ratios of said finely-divided metallic powder, said finely divided silicon carbide taken together with finely divided silicon, and said curable silicone prepolymer, are 0.1 (±5%) : 1.1 (±5%) : 1 (±5%).

13. A PTC thermistor device which has been manufactured according to the method of any one of claims 7, 8, 9 or 11.

14. A PTC thermistor device which has been manufactured according to the method of claim 10.

15. A PTC thermistor device which has been manufactured according to the method of claim 12.

16. A PTC thermistor device which has been manufactured according to the method of claim 7, is serviceable in a working temperature range not less than -55°C to +300°C, and has a life of at least 30,000 hours.